

What is claimed is:

1. Process for the preparation of an α -substituted carboxylic acid selected from the group consisting of α -hydroxycarboxylic acids and N-substituted α -aminocarboxylic acids, which comprises cathodic carboxylation with carbon dioxide at a diamond film cathode of a compound corresponding to the formula $R^1-C(=X)R^2$,

wherein R^1 stands for an optionally substituted radical selected from the group consisting of linear, branched or cyclic alkyl, arylalkyl, aryl and heteroaryl,

R^2 stands for H or a radical designated under R^1 ,

X stands for O or N- R^3

and R^3 stands for a radical designated under R^1 , or for OH,

in a catholyte comprising a conducting salt and an organic solvent,

wherein the carboxylation is carried out in an electrolytic cell divided into a cathode chamber and an anode chamber with the use of an anode which is not soluble under electrolytic conditions.

2. Process according Claim 1, wherein an aliphatic or aromatic-aliphatic aldehyde, which may have one or more substituents which are substantially stable under electrolytic conditions, undergoes cathodic carboxylation as the compound corresponding to the formula $R^1-C(=X)R^2$.

3. The process according to Claim 1 wherein said anode is a diamond film anode.

4. Process according to Claim 2, wherein 3-methylmercaptopropionaldehyde (MMP) undergoes cathodic carboxylation, wherein the dianion of 2-hydroxy-4-methylmercaptobutyric acid (MHA) (=methionine hydroxyl analogue) is formed.

5. Process according to Claim 1, wherein a diamond film electrode which is doped with one or more of the elements selected from the group consisting of boron, nitrogen, phosphorus, arsenic and antimony, is used as the cathode, wherein the anode and the cathode may be doped in different or identical manner.

6. The process according to Claim 5 wherein said element is boron or boron and nitrogen.

7. The process according to Claim 4, wherein the electrode which is doped with one or more of said elements is the cathode and anode.

8. Process according to Claim 1, wherein a catholyte is passed through the cathode chamber and an anolyte is passed through the anode chamber, wherein catholyte and anolyte may contain identical or different conducting salts.

9. The process according to Claim 8, wherein said salts are alkali metal salts.

10. The process according to Claim 9, wherein the alkali metal salts are selected from the group consisting of KCl, KBr, alkaline earth metal halides and quarternary ammonium salts.

11. Process according to Claim 1, wherein the conducting salt of the catholyte and/or anolyte is a tetra (C_1 to C_4)-alkylammonium salt wherein the anion is selected from the group consisting of tetrafluoroborate, hexafluorophosphate, trifluoromethyl sulfonate, trifluoromethyl sulfate, trifluoromethyl acetate and perchlorate.

12. Process according to Claim 1, wherein the the solvent for the catholyte is one or more aprotic dipolar solvents.

13. The process according to Claim 12, wherein the aprotic dipolar solvents are selected from the group consisting of dialkylamides, N-alkyl lactams, nitrites, ethers, sulfoxides, gamma-butyrolactone, and alcohols.

14. Process according to Claim 1, wherein a divided electrolytic cell having an ion exchange membrane is used as the separating element.

15. The process according to Claim 14, wherein the ion exchange membrane is a cation exchange membrane, a clay membrane or a glass membrane.

16. Process according to Claim 1, wherein the cathodic carboxylation is carried out at a pressure within the range atmospheric pressure to 5 bar, wherein the CO₂ partial pressure is within the range 0.1 to 5 bar.

17. Process according to Claim 1, wherein the cathodic carboxylation is carried out with the use of a divided electrolytic cell having plane-parallel electrodes.

18. Process according to Claim 1, wherein the cathodic carboxylation is carried out in potentiostatic manner at a voltage within the range 3 to 30 V, or in galvanostatic manner at a current density within the range 0.1 to 10 A/dm².

19. The process according to Claim 18, wherein the voltage is from 5 to 20 V and the current density is from 0.2 to 2 A/dm².

20. Process according to Claim 1, wherein the α -hydroxycarboxylic acid or N-substituted α -aminocarboxylic acid is obtained from the catholyte, by precipitation of the salt from the formed substituted carboxylic acid anion with a cation which is contained in the electrolyte, by the addition of a substantially nonpolar solvent, and acidulation of the salt which has been separated from the organic phase.